

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

“..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes :
Pollice virgineo teneros hic carpite flores :
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas ;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchyliis succo.”
N. Parthenii Giannettasii Ecl. 1.

No. 13. JANUARY 1849.

I.—*On some new genera and species of Palæozoic Corals and Foraminifera.* By FREDERICK M'COY, M.G.S. & N.H.S.D. &c.

ZOOANTHARIA.

*Petraia** *gigas* (M'CoY).

Sp. Char. Obtusely conical, slightly oblique, section elliptical; *internal cast* divided into forty broad, flat, smooth ribs, separated by the strong sulci of the principal lamellæ reaching to the centre; each of those ribs is divided by a fine mesial sulcus, the remains of the intermediate lamellæ, not reaching to the centre, making the total number of lamellæ about eighty. Length of imperfect cast 2 inches 7 lines; width of long axis at base 11 lines, at edge of cup 3 inches 7 lines (compressed), width of ribs 2 lines.

This large and strongly marked species from the number of its lamellæ can only be confounded with the *P. pluriradialis* (Phil. sp.) and *P. elongata* (Phil. sp.), from both of which it differs in its form and great size, width of ribs on the cast, absence of the punctures, &c. The strong primary lamellæ reach the centre with a very slight indication of twisting; the secondary ones are very delicate towards the base, but become nearly equal

* Having examined Count Münster's original specimens of several species of his genus *Petraia*, I have satisfied myself that they are really corals, as suggested by Mr. Lonsdale and others, although he describes them in his 'Beiträge' as Gasteropods, the publication of which view prevented Prof. Phillips adopting the genus in his work on the Fossils of Devon and Cornwall.

in strength to the others as they approach the edge of the cup. The denticulation of the lamellæ is scarcely perceptible.

Not uncommon in the fine gray Devonian slates of New Quay. (Col. University of Cambridge.)

Clisiophyllum Keyserlingii (M'Coy).

Sp. Char. Conical, slightly curved, terminal cell oblique, 1 inch 2 lines in diameter in a specimen 3 inches long; surface finely striated longitudinally (about eight striæ in one-fourth of an inch); lamellæ thin, equal, about fifty-one, descending straight into the deep part of the terminal star, and then abruptly twisted spirally about an imaginary axis, forming a prominent conical centre about one-third the diameter of the cup, and as high as its base is wide.

This highly typical species of Mr. Dana's American genus *Clisiophyllum* is closely allied to the *Cyathophyllum coniseptum* of Count Keyserling's 'Wissenschaftliche Beobachtungen auf einer Reise in das Petschora-Land,' from which it is distinguished by the strong twisting of the plates about the central cone, and by having little more than half the number of lamellæ at the same diameter. Viewing with Mr. Dana the conical arrangement of the septa as a generic instead of a specific character, it seems probable that the two varieties given by Count Keyserling of his *Cyath. coniseptum* are really two species; and the present species, though presenting some intermediate characters, is I think distinct; if hereafter any one should think otherwise, they still could hardly object to the name I have proposed in honour of so enterprising a geologist, the more so as the term *coniseptum* would not be applicable as a specific name in the genus *Clisiophyllum*, where all have the conical arrangement of septa alluded to; there can however, I think, be little doubt of the distinctness of the species. In the transverse section the central area seems a confused, close crumpling of vesicular plates occupying rather more than one-third the whole diameter, and from it to the circumference the strong, equal, rather distant plates radiate. The external vertical striæ are double the number of the actual radiating lamellæ.

Rare in the carboniferous limestone of Derbyshire.

(Col. University of Cambridge.)

Clisiophyllum bipartitum (M'Coy).

Sp. Char. Very elongate-conic, nearly cylindrical, with a diameter of $1\frac{1}{4}$ inch for the greater part of its length; strongly and regularly striated externally (about five striæ in one-fourth of an inch); external striæ corresponding in number to the radiating lamellæ: in the *transverse rough section* the central area is rather less than one-third the whole diameter, composed of the edges of confusedly blended vesicular plates, crossed by

a few faint extensions of the radiating lamellæ, and divided into two symmetrical portions by a strong median fissure; the space between this inner area and the outer wall is regularly radiated with from sixty-three to sixty-nine equal, thin, rather distant lamellæ connected by numerous delicate, transverse, vesicular plates; *terminal cup* deep, lined by the vertical lamellæ, and having a large oval prominent boss in the centre traversed by a sharp mesial crest; about one-half or one-third of the radiating lamellæ ascend the central boss, always in a direct line, those at the sides of the mesial crest being at right angles to it, the others joining at a more acute angle as they approach the extremity, and opposite one end of the crest we generally observe one or two of the radiating lamellæ shorter than the rest, producing a sort of siphon-like irregularity such as we see in *Caninia*: *vertical section* indistinctly triareal; outer area defined, about one-sixth of the width on each side, composed of small, much-curved, vesicular plates, forming small semicircular cells arranged in very oblique rows upwards and outwards, about seven in a row; inner zone about equaling the outer one in width, passing gradually into the central structure, formed of slightly larger and less curved vesicular plates than the outer zone, and having a nearly horizontal direction; central area composed of large, thin, close, little-curved, vesicular plates, forming a strongly arched series of narrow, elongate cells, the convexity of the arch upwards, conforming to the shape of the central boss in the cup; if the vertical section be at right angles to the medial fissure or crest of the central boss, there is a line visible down the middle of the section.

This coral is interesting to the physiologist from the combination of the bipartite or symmetrical with the radiated type of structure, as in some *Fungia*, &c. It nearly equals the *Caninia gigantea* (Mich.) in size and cylindrical form, but is easily distinguished by the strong longitudinal striæ of the surface, the want of transverse septa in the central area, &c.

Rather common in the carboniferous limestone of Derbyshire. (Col. University of Cambridge.)

Clisiophyllum prolapsum (M'Coy).

Sp. Char. Elongate-conic, much curved and twisted on its axis, *terminal cell* oblique, deep, with steep sides, a narrow flattened or concave space at bottom, from which protrudes the central boss, which is about one-third the diameter of the cup, nearly as high as wide, cylindrical, obtusely rounded above, and with a deep umbilical cavity in the middle (in partially decomposed or weathered specimens a rough vertical fracture frequently

shows the central area as a thick, smooth, persistent tube) ; diameter of the adult little more than an inch, and which it attains at two inches long, remaining nearly cylindrical after that length ; *surface* closely striated longitudinally, about fifteen striæ in one-fourth of an inch, corresponding in number with the radiating lamellæ : *horizontal section*, inner area rather more than one-third the diameter, of small, closely blended, vesicular plates ; outer area with 180 radiating lamellæ, ninety of which reach from the wall to the edge of the inner area, and ninety intermediate ones only reach half way ; intermediate transverse vesicular plates very delicate : *vertical section*, inner area defined by rather thick walls ; it consists of minute, compressed, elongate cells, arranged in transverse curved rows, the convexity of the curve upwards ; outer area, large cellular structure, inclining upwards and outwards.

Rather common in the carboniferous limestone of Derbyshire. (Col. University of Cambridge.)

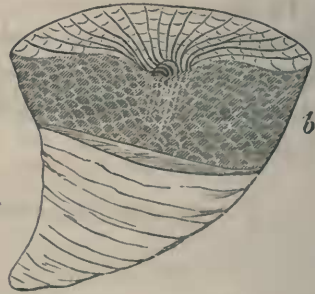
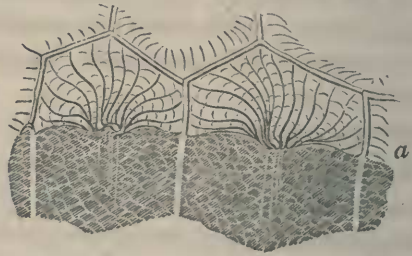
Strephodes (M'Coy), n. g.

Etym. στρέφω, *torqueo* (from the twisting of the lamellæ about the centre).

(*Strombodes* pars of Lonsdale, not of Schweigger.)

Gen. Char. Corallum simple and conic, or compound and form-

ing rounded masses of inseparably united polygonal cells ; in either case the terminal cup is deep with numerous equal, radiating lamellæ, converging from the walls to the centre, where they meet and are complicated, usually twisted in bundles about an imaginary axis : *vertical section*, small vesicular structure, the rows of cells arranged in a semielliptical curve, convexity downwards, descending from the sides at a steep angle and rounding under the centre, where the cells are a little larger than at the sides : *horizontal*



Strephodes : a. vertical section and terminal cells of compound species ; b. do. simple species.

section, radiating lamellæ meeting and complicated in the centre, connected by very thin transverse vesicular plates, and the stars of the compound species separated by thick divisional walls: *budding* in the compound species marginal, in the simple species often exhibiting periodical death and continuance of growth from the centre, giving an imbricating "ringed" appearance to the exterior.

This genus is most allied to *Cyathophyllum* and *Clisiophyllum*, all three having simply conic and compound polygonal-celled species. *Strephodes* differs from *Cyathophyllum* by the equality of the radiating lamellæ and their *meeting* in the centre both in the terminal cup and horizontal section, and in wanting the transverse diaphragms; from *Clisiophyllum*, which it resembles in the meeting of the lamellæ in the centre and the absence of horizontal diaphragms, it differs in the centre (though often slightly projecting) not being elevated into the large tent-like cone, characteristic of that genus, and in the rows of vesicular cells in the vertical section not having the reversed upward curvature which is connected with that peculiar form of cell. The simple species have been placed—I cannot imagine why—in the genus *Strombodes* of Schweigger by Mr. Lonsdale and some others (see the observations below on this latter genus). The compound species differ from *Astræa*, with which many palæontologists confound them, by the solid boundary-walls to the cells (see note on this genus below), and from *Acervularia* (Schweig., not Lonsd.) by the marginal budding and want of the central tube of that genus.

The genus *Streptoplasma* of Hall in his recent volume on the Palæontology of New York, although defined nearly in the same manner, and the name having the same meaning, applies obviously according to his specific descriptions and figures of all the species, not to the present corals, but to those known in Europe under the names *Petraia* and *Turbinolopsis*, in which the lamellæ extend directly and simply almost to the centre, only the most minute portion of the centre exhibiting in some species a trace of twisting, and there being none of the vesicular plates between the lamellæ which are so strongly developed in the present group.

Strephodes multilamellatum (M'Coy).

Sp. Char. Elongate-conic, very gradually tapering (generally about 5 inches long, with a diameter of about $1\frac{1}{2}$ inch at the termination); terminal cell oblique, oval, the short axis about one-third less than the long; surface regularly girt at about every quarter of an inch with slightly oblique, strong cup-

shaped rims of growth, concave above and produced by the successive growths from the centre leaving the prominent edges of the previous cells; weathered surface finely striated by the edges of the vertical lamellæ, of which there are about twelve in a quarter of an inch: the horizontal oval section shows the centre to be excentric, close to one of the broad sides, and formed by the twisting of the radiating lamellæ about an imaginary axis; radiating lamellæ very thin, of equal thickness, about 115 to 180 at the margin, some stopping and some uniting as they approach the centre, about which they are twisted in parcels; all the lamellæ connected throughout, at regular intervals, by minute transverse vesicular plates: internal structure exposed by horizontal and vertical sections, uniformly and minutely cellular.

The great number and closeness of the lamellæ distinguish this species from those published forms allied to it.

Rare in the lower carboniferous limestones of Arnside, Kendal, and Lisardrea, Boyle, co. Roscommon, Ireland.

(Col. University of Cambridge.)

Cyathaxonia costata (M'Coy).

Sp. Char. Elongate-conic, generally about one inch long and half an inch in diameter at the cup, which is circular and horizontal; surface irregularly wrinkled transversely, and marked longitudinally with remarkably thick, strong, sharply-defined striæ, about seven in one-fourth of an inch; central solid axis very thick (often one line in diameter), and from it twenty-six thick, wedge-like, vertical lamellæ radiate to the walls; transverse vesicular plates connecting the lamellæ exceedingly delicate; in the sections the vertical lamellæ are seen to dichotomise upwards, and the large curved plates of the loose vesicular structure incline upwards and inwards towards the axis.

This is more slender in form than the *C. mitratum* (Schlot. sp.) or *C. cornu-copiæ* (Mich.), and from which and all the other turbinated corals of the palæozoic rocks it is distinguished externally by the strong, distinct, distant longitudinal ridges; the internal characters approximate it only to the *Cyathaxonia cornu* (Mich.), from which it is distinguished by its simple, few and thick lamellæ and thick axis, as well as more turbate form.

Rare in the carboniferous limestone of Derbyshire.

(Col. University of Cambridge.)

Cyathophyllum dianthoides (M'Coy).

Sp. Char. Corallum very proliferous, forming wide conical groups; individual cones rapidly expanding, averaging one-third (or less) longer than wide, concentrically wrinkled and with obsolete longitudinal striæ externally; *terminal cup* very deep with either a sharp or truncated edge, and containing from 96 to 100 (as it approaches one inch in diameter) very thin, crenulated radiating lamellæ, alternately longer and shorter: *vertical section* shows less than one-third the diameter on each side occupied by minute vesicular tissue, the rows of cells extending obliquely upwards and outwards; the broad middle part is occupied by close, thick, transverse diaphragms. From eight to sixteen young cones take their origin from the inner part of the margin of favourably situated parent-cups, thus forming compound masses 3 inches or more in diameter, adult cones averaging $1\frac{1}{2}$ inch long.

This is closely allied to the *C. dianthus*, Gold. (*truncatus*, Linn.), and the compound examples of *C. turbinatum* (Linn. and Gold.), but is distinguished from the first by its wide, rapidly expanding cones, and from both by the lamellæ being distinctly of two alternating sizes, much thinner and greatly more numerous.

Common in the carboniferous limestone of Arnside, Kendal. (Col. University of Cambridge.)

Cyathophyllum paracida (M'Coy).

Sp. Char. Corallum of slender cones averaging half an inch wide at mouth and $1\frac{1}{2}$ inch long (generally somewhat smaller), straight or variously bent, and sometimes irregularly coalescing so as to form loose irregular masses; three or four young cones take their origin from within the margin of the parent cell, which they smother by their growth: *internal structure*, centre occupied by broad slightly undulated transverse diaphragms, four-fifths the width of the tubes; narrow outer area occupied by thirty-two equal, narrow, radiating lamellæ, variously connected by small, curved, vesicular plates; outer surface faintly striated longitudinally.

Allied to the *C. cæspitosum* and *C. quadrigeminum* of the older rocks, but the branches are not so long and cylindrical as in the first, nor so short or laterally united as in the latter; the number of the lamellæ and character of the narrow lamelliferous zone, and the very wide, distinct transverse diaphragms will serve to discriminate even fragments of the species.

Not uncommon in the carboniferous limestone of Derbyshire. (Col. University of Cambridge.)

Cyathophyllum pseudo-vermiculare (M'Coy).

Sp. Char. Elongate, cylindrical, flexuous; surface very irregular, annulated or transversely nodular, coarsely striated longitudinally (about six striæ in one-fourth of an inch); branches averaging from half to three-fourths of an inch in diameter; small cylindrical branches project at distant irregular intervals from the sides: *internal structure*, central area rather more than half the diameter of the tube, defined, composed of flat, slightly undulated transverse septa, bearing at their circumference a series of from twenty-four to twenty-seven very short, rather distant radiating lamellæ, not reaching half-way to the centre; interval between this inner area and the walls filled with loose cellular structure, formed of small vesicular curved plates, highly inclined upwards and outwards.

This interesting coral perfectly resembles the *Cyathophyllum vermiculare* of Goldfuss in external characters, but by cutting and grinding down some specimens of the true Eifel coral of that species, I have ascertained beyond doubt (what was before suspected by Mr. Lonsdale) that it is not a true *Cyathophyllum*, but belongs to that group which I have named *Strophodes*, having the radiating lamellæ extending from the walls to the centre, and there twisted together without transverse diaphragms; it also has the curious character of the radiating lamellæ having an elliptical section, being thicker in the middle than at either end, a peculiarity which I have also noticed in a British (Devonian) specimen of the same species, though not alluded to by Mr. Lonsdale in his note on this species in the memoir of Prof. Sedgwick and Sir R. Murchison on the Devonian System. The present mountain limestone coral I have shown above to possess the true *Cyathophyllum* structure, and it is not therefore likely, after what I have stated with regard to the Devonian species, to be in future confounded with it. Externally it also bears a strong resemblance to the mountain limestone fossil which I have called *Lonsdaleia duplicata* (Mart. sp.), but that coral I have ascertained to possess the very different internal structure of *Lithostrotion* of Lonsdale (*Strombodes* of Schweigger), and it is consequently with a little care incapable of being confounded with the present fossil.

Not uncommon in the lower carboniferous limestone of Kendal; a variety also occurs in the lower carboniferous limestone of Kiltullagh, Roscommon, Ireland.

(Col. University of Cambridge.)

Diphyphyllum lateseptatum (M'Coy).

Sp. Char. Stems upwards of 8 inches long, cylindrical, about 3 lines in diameter; nearly smooth, very faintly striated lon-

gitudinally, and obsolete wrinkled concentrically: *vertical section*, middle area occupied by slightly irregular transverse diaphragms extending across two-thirds the diameter of the tubes, about four in the vertical space of one line, their edges abruptly bent downwards; lateral areas very narrow, of equal width, the inner composed of one set of minute horizontal plates, the outer of two rows of minute, curved, vesicular plates inclining upwards and outwards.

This species differs from the *D. concinnum* (Lonsd.) of the carboniferous limestone east of the Ural chain, in the great proportional width of the transverse medial plates, which average two-thirds the diameter of the stem, or three times the width of the two outer areas of one side in the present species, but average one-third the diameter of the stem, or about equal to the two outer areas of one side in the other. The dichotomous mode of division of the stems characteristic of this group, and also the conical upward projections of the centre of the transverse lamellæ immediately under the point of fissure, were very well shown in many of the specimens.

Abundant in the carboniferous limestone near Corwen.
(Col. University of Cambridge.)

Stylastræa irregularis (M'Coy).

Sp. Char. Corallum of polygonal (five- or six-angled) tubes two lines in diameter, of such twisted and irregular upward growth that a vertical fracture frequently exposes a mixed appearance of outer walls and internal section; outer surface longitudinally striated and transversely wrinkled by waves of growth: *vertical section*, inner area broad, regularly septate by nearly straight, equal, thick transverse plates; outer area very narrow, composed of much-curved vesicular plates, forming rather open rounded cells, in rows obliquely upwards and outwards, two or three in a row: *horizontal section*, central area smooth, surrounded by about thirty slightly flexuous radiating lamellæ from the walls, fifteen of which are much shorter than the others; near the walls the radiating lamellæ are connected by few, thick, vesicular plates.

This species is remarkable for the peculiar, irregularly twisted mode of growth of the columns, which, when the rock is compact, gives the mixed character to the fracture seemingly between that of *Lithostrotion* (*Strombodes*) and *Stylastræa*. It is also remarkable for the nearly perfect transverse chambering of the central area. The small diameter of the tubes and few lamellæ easily distinguish it from the other allied species.

Forms small masses in the carboniferous limestone of Derbyshire.

(Col. University of Cambridge.)

Strombodes.

Strombodes (Schweigger, not of Lonsdale) = *Lithostrotion* (Lonsd.).

This genus is defined by Prof. Schweigger (Beobachtungen auf Naturhistorischen Reisen, &c. tab. 6) as "*Cellulæ lamellosæ, centro depresso. Stirps e conis lamellosis in strata horizontalia conjunctis. Cellula terminalis cyathiformis.*" And he makes two divisions: 1st, "*coni e centro proliferi,*" for which he refers to the 'Amœnitates Academicæ' of Linnæus, vol. i. pl. at p. 312, figs. 11 and 4 (this figure however shows the origin of a *marginal bud* at one point). His 2nd group, "*coni e disco proliferi,*" and the reference to the same plate, figs. 10 and 3, belong to a true *Cyathophyllum* (*C. dianthus*, Gold.); his 1st group and the reference to the figures and description in the 'Amœnitates Academicæ' must therefore be taken as the type of the genus, and seem fully to justify the reference by Goldfuss of his American *Strombodes pentagonum* to this genus, the more so when the reference in Foug't's description, above referred to, to fig. 18 of the above plate, is taken into account. A coral perfectly similar to that of Goldfuss has been also figured by Mr. Dana in 'Silliman's Journal' as an example of *Strombodes*. As therefore the notion that those compound polygonal-celled corals are the true *Strombodes* of Schweigger seems to prevail extensively, and I think justly, it only remains for me to add, that having carefully examined authentic specimens of the *S. pentagonum*, I find the cone-in-cone appearance of some of the figures to be produced by a peculiarity of weathering by which many of the vesicular plates towards the circumference of the stars have fallen out, and that the coral truly possesses all the characters so admirably elucidated by Mr. Lonsdale in the 'Geology of Russia' under the title of *Lithostrotion*, a name which it would be well now to replace by the old title *Strombodes* of Schweigger. In no case could either the definition or references of Schweigger justify the placing those Silurian and Devonian corals called *Strombodes* by Mr. Lonsdale in this genus. The following species is generically placed in accordance with this view.

Strombodes conaxis (M'Coy).

Sp. Char. Columns irregularly aggregated, averaging half an inch in width, mostly hexagonal: *axis* elliptical, formed of a series

of closely superposed conical plates, connected by a few fine vertical lamellæ: *lamelliferous zone* surrounding the axis narrow, of about forty-two alternately broad and rudimentary lamellæ, the interstitial plates of which are nearly horizontal: *outer zone* wide, formed of large arched plates, not highly inclined, and forming a loosely vesicular structure: *terminal star*, axis very prominent, oval, vertically ribbed, but not twisted, seated in a deep oval or circular cup, lined by the strong radiating lamellæ; outer zone nearly flat, oblique at the sides, faintly marked with rather distant, fine lines, representing the strong radiating lamellæ of the inner zone, continued to the boundaries of the cells, which are strong, prominent and slightly crenulated.

A vertical section shows first, the outer largely vesicular area formed of broad, curved, slightly inclined plates; between this and the inner area there is a fine vertical defining line, within which the plates of the inner zone are seen to be finer and closer than those of the outer, forming a smaller cellular structure; the rows of cells are nearly horizontal near the outer zone, but within seem gradually to bend up and become continuous with the conical cup-like plates forming the axis; those conical plates of the axis seem connected by extremely delicate, irregular, radiating plates; in a rough transverse section the axis appears as a deep conical hollow on the under side. It will thus be seen that in the remarkable cone-in-cone structure of the axis this resembles the Russian *Strombodes mammillare* and *S. astroides* (*Lithostrotion id.* of Lonsdale), from both of which it differs in the axis not being twisted in the terminal star, in the outer zone not being traversed by strong radiating lamellæ, from the former in the much less obliquity of the plates of the outer area, and from the latter by the largely cellular structure of the outer area, as well as the distinctness of all the three areas under every circumstance. In general appearance and imperfect radiation of the outer area it resembles the *S. emarciatum* and *S. floriforme* (*Lithostrotion id.* of Lonsdale), but is distinguished from the first by the rudimentary radiating lamellæ between the primary ones, and from both by the conical structure of the axis, which is formed in them of irregularly twisted vertical plates.

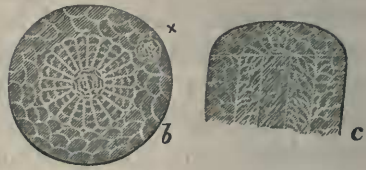
Not uncommon in the carboniferous limestone near Bakewell, Derbyshire.

(Col. University of Cambridge.)

Lonsdaleia (M'Coy), n. g.

Gen. Char. Corallum composed of circular, tapering, proliferous stems, never laterally united; internally composed of three

areas; 1st, a cylindrical, defined, complex axis composed of irregularly blended vesicular plates; 2nd, a cylindrical, defined area of strong, vertical, radiating lamellæ, connected by thin transverse dissepiments, only visible in the vertical section; 3rd, a wide, largely cellular outer zone between the vertical lamellæ and the external wall of the stem, composed of much-curved vesicular plates extending obliquely upwards and outwards: outer walls of the tubes longitudinally striated and transversely rugose: reproduction by circular germs developed in the cellular outer zone, and springing at once obliquely



without the area of the parent stem, which continues its growth uninterruptedly with the slender young stem projecting from one of the transverse rugosities of the external surface; the young stem seems at first only composed of the axis, and gradually acquires the inner lamelliferous and outer vesicular zones as it increases in size.

Lonsdaleia: a. old branch exterior and terminal cups and young one growing from the side.
b. Transverse section showing the three areas and a bud (x) growing in the outer one.
c. Vertical section.

The little-known *Erismatholites Madreporites duplicatus* of Martin's 'Petrificata Derbiensia' may be looked upon as the type of this genus, which I have dedicated to Mr. Lonsdale as a slight token of my admiration for his labours in illustrating the structure of fossil corals. It will be seen from the above notice to unite in itself the internal structure of *Strombodes* (*Lithostrotion*, Lonsd.) with the external character and mode of growth of *Cyathophyllum* (*C. dianthus*, &c.).

Lonsdaleia crassiconus (M'Coy).

Sp. Char. Corallum forming groups or loosely connected masses of elongate-conical stems, averaging 6 to 7 lines in diameter; surface with concentric wrinkles and coarse flexuous longitudinal striæ; lateral branches rapidly expanding, conical, widening from their base at the rate of 6 lines in 9 lines of length: horizontal section shows a central circular axis $1\frac{1}{2}$ line in diameter of closely twisted laminae; outside which is a circular area 3 lines in diameter, of about twenty-four vertical radiating lamellæ, with few or no connecting vesicular plates between

them ; the outer area composed of small, irregular, curved vesicular plates, forming an irregular cellulose texture : *vertical section*, the central axis of close, spirally and conically twisted laminæ ; inner area of one row of distant, delicate, irregular, curved transverse plates forming very open cells ; outer area defined from the inner, formed of loose irregular cellular tissue, of large, slightly-curved vesicular plates, extending obliquely upwards and outwards.

This species is much less irregularly wrinkled than the *L. duplicata* (Mart. sp.), forms shorter and more widely turbinated masses, and is distinguished externally at a glance by the lateral branches expanding rapidly from their point of attachment to a conical form, while in the *L. duplicata* the lateral branches retain their original small diameter for a great length (increasing at about the rate of 4 lines in 3 inches), and present a strange contrast to the parent stem, as is faithfully shown in the rough figure of Martin.

In the red carboniferous limestone of Arnside, Kendal ; also near Bakewell, Derbyshire, in the limestone of the same age.

(Col. University of Cambridge.)

Lonsdaleia rugosa (M'Coy).

Sp. Char. Branches 6 or 7 lines in diameter, elongate-conic, exceedingly rugose with large transverse irregular undulations and funnel-shaped irregularities of growth, crossed by coarse, obtuse longitudinal striæ (four in the space of 2 lines) ; young lateral branches small, continuing very slender for a considerable length ; terminal cups deep, with a prominent compressed axis in the centre, middle portion with strong radiating lamellæ, which, as they approach the margin, become fainter and united into a network by strong interstitial vesicular plates : *horizontal section*, central axis 2 lines wide, of close, fine, complicated laminæ, crossed by one thick mesial plate ; axis surrounded by an area 5 lines wide, of about forty-two equal radiating lamellæ, with very few and delicate transverse vesicular plates ; outer area partially radiated by delicate prolongations of the radiating lamellæ, with numerous strong curved vesicular plates : *vertical section* shows a thick solid line indicating the *centre* of the axis (and corresponding to the mesial line through the axis of the cross section), from which the delicate, thin, close, complicated laminæ of the axis diverge downwards, but *pass gradually* into the larger and more horizontal cellular tissue of the second area ; this latter is separated by a definite line from the outer area, which is of smaller cellular tissue, composed of small, curved, vesicular plates extending obliquely upwards and outwards.

In general appearance this resembles the *L. duplicata* (Mart. sp.), but is much more rugose, and the young branches expand more rapidly; in the vertical section it is distinguished by the central line and the undefined sides of the axis, as well as the very much smaller size of the cells of the vesicular structure, and the much greater number of the radiating lamellæ, which do not exceed twenty-four or twenty-six in that species. There is a slight external resemblance between this coral and the *Cyathophyllum pseudo-vermiculare* (M'Coy), but the prominent axis easily distinguishes it.

Common in the carboniferous limestone of Corwen.
(Col. University of Cambridge.)

Lonsdaleia ? stylastræiformis (M'Coy).

Sp. Char. Corallum composed of easily separable (four- to six-sided) prismatic tubes from 3 to 5 lines in diameter; outer walls faintly striated longitudinally, and marked with arched, transverse, imbricating rugosities: *vertical section*, axis large, defined, composed of irregular, spirally complicated lamellæ; inner area of little-curved, vesicular plates, inclining obliquely upwards and outwards, each plate generally extending from the axis to the circumference of the inner zone, so that there is but one, or occasionally two lengthened cells in a row between those points; outer area narrow, composed of slightly arched plates inclining obliquely upwards and outwards, each plate usually reaching from the inner zone to the outer wall; more rarely a second arched plate is required, so that generally there is but a single row of long cells between the inner zone and outer wall, with occasionally a small irregular cell towards the margin: *transverse polished section* showing a large oval or circular, irregularly reticulated or cellular axis, from which twenty-five lamellæ of equal length and thickness radiate almost to the outer walls, the cellular lining of the walls free of radiating lamellæ being very narrow, and forming apparently a single row of irregular cells; the spaces between the radiating lamellæ crossed by very thin arched plates: *transverse rough fracture* generally cup-like above, the outer zone forming an oblique, nearly uniform margin, faintly undulated in a radiating direction, within which is the rough flat fracture of the inner zone and axis; on the under side the position of those parts is reversed, the inner area being prominent and surrounded by a narrow, radiated border sloping to the walls.

This coral is very remarkable for uniting in itself the internal structure of *Strombodes* (*Lithostrotion*, Lonsd.) with the external form and easily-separable columns of the *Stylastræa* of the same

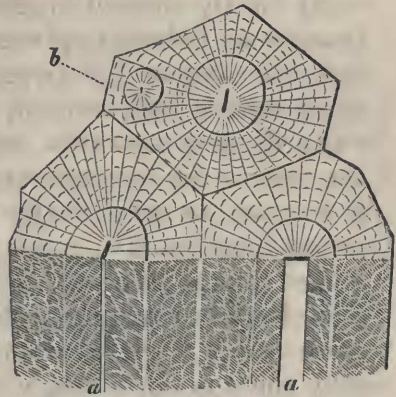
writer. I am unable to afford any information on what would under the circumstances be the most interesting point, namely the mode of production of new columns: taking all the circumstances into consideration, I suspect the mode of increase was similar to that I have described in *Lonsdaleia* generally, the external prismatic form (which is of itself of no value) being produced by the pressure of a closer mode of growth than in the *L. duplicata*. As it is impossible to conceive a *Strombodes* (or *Lithostrotion*) splitting into easily-separable columns, I provisionally therefore place it in *Lonsdaleia*.

Rare in the carboniferous limestone of Kendal.

(Col. University of Cambridge.)

Nemaphyllum (M'Coy), n. g.

Gen. Char. Corallum composed of numerous inseparably united, polygonal, prismatic tubes, each having a straight, thin, flat, fillet-like solid, or nearly solid, axis, from which, in the *horizontal section*, the fine numerous radiating lamellæ are seen extending directly to the walls; radiating lamellæ connected by very fine transverse dissepiments only visible externally in the outer area: *vertical section* shows three distinct areas; 1st, the thin flat axis; 2nd, a sharply defined cylinder of very minutely vesicular arched plates, the rows directed from the axis obliquely downwards and outwards; outside this is the 3rd area of similar small arched plates forming a minutely vesicular structure slightly smaller than that of the inner zone, but the rows directed obliquely upwards and outwards: *reproduction* by small circular buds developed within the area of the parent star.



Section and terminal stars of *Nemaphyllum*: *a a.* axes; *b.* young bud within the area of the parent.

In mode of reproduction and tri-areal structure this genus approaches *Strombodes* (as above understood), from which it differs altogether in the nature of the axis, which in all the species of that genus is cylindrical, composed of numerous plates variously twisted together, and giving a cellulose section in every direction; the axis of the present group on the contrary forms a thin, flat, simply solid lamina, and is exhibited in a vertical fracture either as a narrow opaque white line, or as a broad ribbon-like fillet, according to whether the section is in the direction of its width or

across it; a further difference is constantly observable between those groups in the vertical section, which is, that the interstitial vesicular plates of the inner area in *Strombodes* have their rows either nearly horizontal or inclining obliquely upwards from the axis towards the outer wall, while in *Nemaphyllum* on the contrary they converge towards the axis above and incline downwards and outwards below, so as to meet at a considerable angle those of the outer area which incline in the usual direction upwards and outwards towards the walls; this peculiarity in the inclination of the interstitial vesicular plates of the inner area produces a marked difference in the stars on the weathered surface in the two genera, causing the inner area to form a large prominent oval or conical boss in *Nemaphyllum*, and a flat or deeply hollowed cup in *Strombodes*. A third difference between those generic groups is, that in the latter the vertical radiating lamellæ are principally confined to the inner area, not existing in most of the species at all in the outer area, and do not reach the walls, while on the contrary all the radiating lamellæ in *Nemaphyllum* arise from the outer walls, are strongest in the outer area, and only half of them in general penetrate the inner area. In the latter corals also the whole vesicular structure is much more minute and delicate in stems of the same size than in the others, and the cells of the inner area are larger than those of the outer, which is the reverse of what we find in *Strombodes*. As the young columns are produced from circular buds continuing their development *within* the walls of the parent, it results that the stems are inseparably united; the walls defining the stars being one simple plate, the joint production of the adjacent polypes, cannot be divided, and consequently vertical fractures of the mass, instead of exposing the flat, striated external surface of the stems, pass invariably through the substance of the coral itself, exposing only sections of the interior; the external walls being only seen in those rare cases showing the extreme limits of a mass, or where in a section two masses may have coalesced. Some of the species resemble *Clisiophyllum*, but are distinguished by the peculiar axis and by the cells of the inner area being larger and fewer than those of the outer. The genus is I believe exclusively palæozoic.

Nemaphyllum arachnoideum (M'Coy).

Sp. Char. Stars with from four to seven angles, and averaging from 6 to 9 lines in diameter; axis very thin, 1 line wide: *vertical section*, inner vesicular area wider than the outer, of little-arched plates inclining slightly downwards from the axis; it takes about two of those plates to reach from the axis to the extent of this area, or two irregularly elongate unequal cells

in an oblique line from the axis to the wall of the inner area ; outer area separated from the inner by a sharp distinct line on each side, and composed of much smaller and more highly curved vesicular plates, so that there are from five to seven small, nearly equal, rounded cells extending in a line obliquely upwards and outwards from the inner area to the outer walls of the tube : *horizontal section*, boundary or divisional walls thin, stars radiated with from fifty to fifty-five very thin lamellæ, of equal thickness, but alternately long and short, the long reaching to the centre, the short barely entering the edge of the inner area : *weathered surface*, stars flattened, separated by a depressed line ; inner area forming a gently convex oval or circular boss, with the axis forming a short impressed line in the middle ; the radiating lamellæ exhibit numerous delicate curved interstitial plates in the outer area, but none in the inner area.

This beautifully delicate species is the largest of the genus I am acquainted with, the usual width of the stars being about 7 lines, diameter of the inner area about $2\frac{1}{2}$ lines. It very frequently exhibits the young oval buds within the corners of the old stars, generally but one, very rarely two in a star.

Forms large masses in the carboniferous limestone of Derbyshire.

(Col. University of Cambridge.)

Nemaphyllum minus (M'Coy).

Sp. Char. Stars having from four to seven angles and averaging from 3 to 4 lines in diameter ; axis thin, about $\frac{3}{4}$ ths of a line wide : *vertical section*, inner area slightly wider than the outer on each side, composed of slightly curved vesicular plates extending obliquely downwards and outwards, each one nearly reaching from the axis to the external boundary of the inner area, forming thus but one or two cells in each oblique row between those points ; outer area of smaller and more curved plates, forming smaller, more regular and rounded cells disposed in indistinct rows obliquely upwards and outwards, about four in a row from the inner area to the outer wall : *weathered surface*, stars nearly flat, separated by impressed lines, inner area forming a large convex oval or circular boss in the middle of the star and having the axis in the centre ; radiating lamellæ forty-five, thin, of equal thickness, one-half of them reaching the centre, the intermediate ones entering but a short way into the inner zone ; numerous small, curved, interstitial plates between the lamellæ in the outer zone, not visible in the inner one.

This species is allied to the *N. arachnoideum* (M'Coy), but is
Ann. & Mag. N. Hist. Ser. 2. Vol. iii. 2

constantly distinguished by the smaller size of the stars, fewer radiating lamellæ, and more open internal vesicular structure.

Forms large masses in the carboniferous limestone of Kendal. (Col. University of Cambridge.)

Nemaphyllum decipiens (M'Coy).

Sp. Char. Weathered surface having the stars undefined, the lamellæ of the outer area of adjoining cells appearing continuous, and forming a flat surface, in which the inner area of each star forms a deep cylindrical cell $1\frac{1}{2}$ line in diameter, and about their own diameter apart; in the bottom of those cells the lamellæ rise to form a little cone, from the apex of which projects (when well-preserved) the long thin flat axis, rising to the level of the outer area; on the polished *transverse section* the stars are perfectly defined by distinct walls four- to six-angled, 2 to 3 lines in diameter, with a flat central axis half a line wide, and show the circular germs of young columns in the corners of some of the old stars; radiating lamellæ thin, about thirty-four, of equal thickness, one half reaching the centre, the other barely touching the inner area, which forms a circle about $1\frac{1}{2}$ line in diameter; the radiating plates are connected by numerous curved vesicular plates in the outer area, but few or none are visible in the inner area: *vertical section*, axis thin, solid; inner area of small, curved, vesicular plates extending obliquely downwards and outwards from the axis, about two or three cells in a row; outer area separated from the inner by a thin vertical line, it is composed of small curved vesicular plates, in rows inclining obliquely upwards and outwards, about four cells in a row.

The flat broad spaces between the cups, the seeming continuity of the radiating lamellæ of adjoining stars, and the apparent want of divisional walls between those latter, give the weathered surface of this coral much the aspect of the so-called *Astræa Hennahii* (Lonsd.) of the Devonian rocks; but it is clearly distinguished by the divisional walls appearing distinctly in the horizontal sections, and by the flat, nearly solid axis, which is very obvious both in the polished section and weathered stars.

Not uncommon in the carboniferous limestone of Derbyshire. (Col. University of Cambridge.)

Nemaphyllum clisioides (M'Coy).

Sp. Char. Stars generally hexagonal and averaging 2 lines in diameter: *weathered surface*, stars defined by a rather thick, prominent, crenulated divisional wall; outer area inclined downwards and inwards to form a shallow cup, in the middle of which the inner area rises into a conical tent-like boss having

the small flattened axis in the centre: *horizontal section*, divisional lines of the stars thin, straight; axis thin, half a line wide; radiating lamellæ thirty-six, thin, one half extending in a flexuous manner from the walls to the centre, the intervening ones also flexuous but of irregular lengths, most of them reaching half-way; transverse vesicular plates very few and delicate, if visible at all: *vertical section*, axis as in the other species; inner area very wide, of large, little-curved vesicular plates, inclining obliquely downwards and outwards; one or two lengthened irregular cells reach from the axis to the outer area; outer area very narrow, of small, much-curved vesicular plates inclining very obliquely upwards and outwards, forming minute rounded cells about two in a row.

This species much resembles some of the massive Astræoid *Clisiophylliæ* of Dana by the conical tent-like aspect of the inner area within the cups or weathered terminal cells; the distinct flattened axis, resembling that of the other *Nemaphylliæ*, will however distinguish it. The flexuous character of the radiating lamellæ in the transverse polished section is remarkable. The *Astræa irregularis* of Portlock's 'Report on Londonderry,' &c which I know to be a true *Nemaphyllum*, resembles this species in the small size of the stars and flexuous lamellæ, but is easily distinguished by the cells being simply cup-shaped, descending uninterruptedly from the walls to the small, flat, prominent axis in the bottom of the cup, instead of the large tent-like boss formed by the inner zone of the above.

Forms irregular tuberoso masses in the carboniferous limestone of Derbyshire.

(Col. University of Cambridge.)

Nemaphyllum septosum (M'Coy).

Sp. Char. Corallum of long, inseparable, slightly diverging five- or six-angled tubes, with an average diameter of 5 lines: *vertical section*, axis straight, thin, flat, three-fourths of a line wide; inner area composed of large, rather distant, slightly arched plates, each of which generally extends across the entire area, so that one lengthened cell (rarely more) reaches from one side to the other of this area, having the axis in the middle; outer area broad, of numerous minute, much-arched vesicular plates inclining obliquely upwards and outwards, about four of the little cells in the oblique line from the inner area to the outer wall: *transverse rough fracture* showing the inner area to be composed of slightly conical or cup-shaped plates, their diameter equal to that of the area, and pierced in the centre by the flat persistent axis: *polished transverse sec-*

tion, radiating lamellæ forty-eight, thin, twenty-four of which reach the centre, while the intervening ones are nearly marginal, not reaching half-way to the inner zone; interlamellar vesicular plates very numerous and delicate in the outer zone, apparently absent in the inner zone.

This species has some affinity with the *N. minus* (M'Coy), but is constantly distinguished by the open, simple, subseptate character of the inner zone in the vertical section, the extreme comparative shortness of the alternate lamellæ in the transverse section, and the peculiar character of the broad, simple, cup-like plates of the inner zone in the rough transverse fracture.

Very common in the carboniferous limestone of Tullyard, Armagh, Ireland.

(Col. University of Cambridge.)

[To be continued.]

II.—*Note on the Colour of a Freshwater Loch.* By GEORGE DICKIE, M.D., Lecturer on Zoology and Botany in the University and King's College of Aberdeen*.

VARIOUS vegetable productions have on different occasions been recorded as having appeared in such profusion that they communicated a colour of greater or less intensity to bodies of fresh water in which they naturally live. The plants in question belong to the *Oscillatorieæ* and *Nostochineæ*; among the former, *Oscillatoria ærugescens* has been recorded by Dr. Drummond (Ann. Nat. Hist. vol. i. 1st Series) as giving a tinge to the water of Glaslough in Ireland†; I have found the same species at Aberdeen, and particularly abundant in a small and shallow artificial lake, in sheets of great extent at the bottom. I have not observed it, as stated by Dr. Drummond, "broken into innumerable fragments, and suspended like cloudy flocculi in the water;" it sometimes however becomes detached from the bottom and forms large masses on the surface. The following plants belonging to the *Nostochineæ* have been described by Mr. Thompson of Belfast as producing the same effect: the *Anabaina spiralis* (*Spirillum Thompsoni*, Hass.) was observed to colour Ballydrain Lake in the county of Antrim; *Anabaina Flos-aquæ*, Bory, he saw "tinging with its delicate green hue the margin of the smallest of the Lochs Maben in Dumfries-shire," and *Aphanizomenon incurvum*, Morren, was "observed on the surface of sheltered creeks in Ballydrain Lake."

* Read before the Botanical Society of Edinburgh, Nov. 9, 1848.

† *Oscillatoria rubescens* has been observed to communicate a red tint to Lake Morat in Switzerland.